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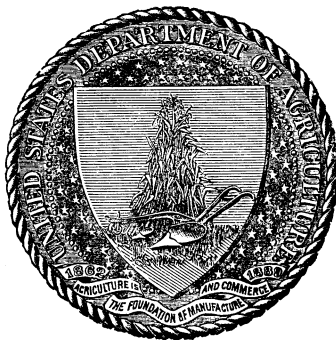
FARMERS' BULLETIN No. 83.

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# TOBACCO SOILS.

BY

MILTON WHITNEY,  
CHIEF OF DIVISION OF SOILS.



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## LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,  
DIVISION OF SOILS,

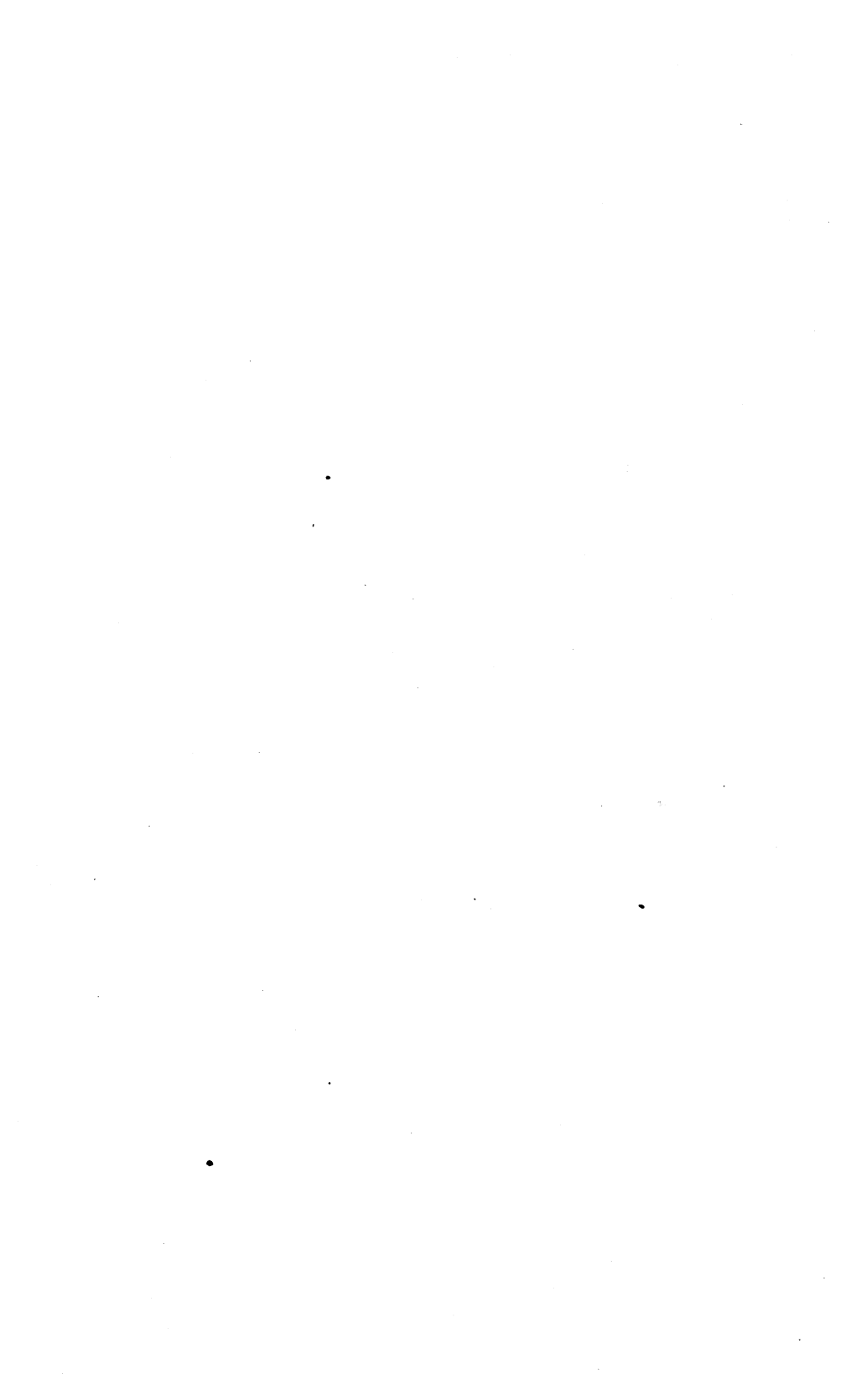
*Washington, D. C., June 20, 1898.*

SIR: I submit herewith a paper upon Tobacco Soils, which I recommend be published in the form of a Farmers' Bulletin. This is part of some preliminary work which has been done in the examination of the soils of the principal tobacco districts of the country, and is offered as a further addition to the number of bulletins upon tobacco which are being issued by the Department. The matter has been treated more at length in Bulletin No. 11 of this Division.

Respectfully,

MILTON WHITNEY,  
*Chief of Division.*

Hon. JAMES WILSON,  
*Secretary of Agriculture.*



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# TOBACCO SOILS.

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## INTRODUCTION.

The Department is constantly in receipt of letters asking for information and advice in regard to the growing of tobacco. For this reason a series of Farmers' Bulletins have been planned to cover different phases of the production and sale of tobacco. The main points of inquiry seem to be in regard to the kind of tobacco which should be grown and the method of curing the product.

Tobacco can be grown in nearly all parts of the country, even where wheat and corn can not be economically produced. The plant readily adapts itself to a great range of climatic conditions, will grow on nearly all kinds of soil, and has a comparatively short season of growth. But while it can be so universally grown, the flavor and quality of the leaf are greatly influenced by the conditions of climate and soil. The industry has been very highly specialized, and there is only demand now for tobacco possessing certain qualities adapted to certain specific purposes. A nondescript tobacco is not worth growing and should not be grown, as it lowers the price of really good types of tobacco, to the detriment alike of the grower and the consumer. As climate and soil conditions determine the character of the tobacco, it is important to understand what kinds of tobacco are in demand and what the climatic and soil conditions are which will most easily produce the qualities desired.

The principal kinds of tobacco grown in this country are the cigar types, for our domestic supply of cigars; the manufacturing types, for smoking and chewing, for our domestic use; the bright yellow tobacco, for cigarettes, smoking, and plug wrappers; White Burley, for smoking and chewing, both for domestic and export trade; and the export types proper, which are not suited to our domestic use, but which are mainly exported to foreign countries to be used both for cigar and manufacturing purposes.

In the ten years between 1879 and 1889 the acreage and yield of the cigar tobaccos were very considerably increased. The manufacturing and export districts can not be sharply separated, as both kinds of tobacco are frequently grown in the same district and the same kind is frequently used for both purposes. On the whole, there was a considerable decrease in the acreage and yield of these classes. With the bright yellow and burley tobaccos there was a large increase in both acreage and yield.)

## CLIMATE AND DISTRIBUTION OF TOBACCO.

It is a curious and interesting fact that tobacco suitable for our domestic cigars is raised in Sumatra, Cuba, and Florida, and then passing over our middle tobacco States, the cigar type is found again in Massachusetts, Connecticut, Pennsylvania, Ohio, Indiana, Illinois, and Wisconsin. The tobacco which we use only for chewing and smoking and which we send abroad is raised in the intervening States, the very best locality lying just below the latitude of southern Ohio.

It is surprising to find so little difference in the meteorological records for these several places during the crop season. There does not seem to be sufficient difference to explain the distribution of the different classes of tobacco, and yet this distribution is probably due mainly to climatic conditions.

One must still judge therefore, so far as the climate is concerned, mainly from the experience of others as to the class of tobacco to be raised, as the ordinary meteorological record will be of very little value in determining this point. The plant is far more sensitive to these meteorological conditions than are our instruments. Even in such a famous tobacco region as Cuba, tobacco of good quality can not be grown in the immediate vicinity of the ocean or in certain parts of the island even on what would otherwise be considered good tobacco lands. This has been the experience also in Sumatra and in our own country, but the influences are too subtle to be detected by our meteorological instruments.

Little, therefore, can be said at the present time in regard to the suitable climatic condition for tobacco of any particular type or quality.

## SOILS OF THE SEVERAL DISTRICTS.

Under given climatic conditions the class and type of tobacco depend upon the character of the soil, especially on the physical character of the soil upon which it is grown, while the grade is dependent largely upon the cultivation and curing of the crop. Different types of tobacco are grown on widely differing soils all the way from the coarse, sandy lands of the pine barrens to the heavy clay limestone grass and wheat lands. The best soil for one kind of tobacco, therefore, may be almost worthless for the staple agricultural crops, while the best for another type of tobacco may be the richest and most productive soil of any that we have. It is particularly true of tobacco, to a greater extent perhaps than of any other crop, that the texture and physical properties of the soil influence the physiology of the plant to such an extent as to determine and control the distribution of the widely differing distinct types of tobacco. Soils producing a heavy shipping tobacco will not produce fine tobacco of any variety. Soils containing a large proportion of clay, or which for other reasons are very retentive of moisture, tend to produce large, heavy plants, which cure to a dark

brown or red. A lighter sandy soil produces a plant having a thinner and more delicate leaf, which by proper treatment can be cured to a bright red mahogany or fine yellow color. So marked is this influence of soil upon the quality of the tobacco, that a fine, bright tobacco land may be separated by only a few feet from a heavier clay soil, which will produce only a heavy manufacturing or export leaf.

Manures and fertilizers tend always to increase the yield per acre, but where large quantities of nitrogen are added to the soil there is a tendency for the leaf to become thicker, heavier, and more gummy. In the case of the fine bright tobaccos or naturally thin-textured leaves this is apt to cause a marked deterioration in the character of the leaf; but with the heavier varieties this result is far from undesirable, because it merely increases the normal influences of the soil in making the leaf heavier, richer, and of more body. Considerable control can therefore be exercised upon the quality or grade of the leaf not only by judicious cultivation, but by proper fertilization.

#### **NORTHERN CIGAR TOBACCO.**

The grade of tobacco used to wrap a cigar for domestic purposes is quite different from that suitable for the filler. Theoretically the wrapper leaves are the best on the plant, the binders are second quality, while all the other leaves are used for filler purposes. The one plant, therefore, is supposed to produce the filler, binder, and wrapper for the complete cigar. As a matter of fact, this is seldom satisfactorily accomplished with the same plant except in Cuba and our Southern States. In the Northern tobacco States a plant which will produce a good wrapper leaf does not, as a rule, make a very good filler. Good domestic wrapper leaf is worth anywhere from four to twenty times as much per pound as a filler leaf, but as the filler leaf is grown on heavier soil, with closer planting, the yield per acre is much larger and, as the cultivation and treatment of the tobacco is less expensive, the return per acre, even at the low price per pound at which it is sold, can be made as profitable as the wrapper.

The Pennsylvania filler is seldom wrapped now with its own leaf. It is wrapped with either a Cuban, Sumatra, Connecticut Valley, or Wisconsin wrapper. A Connecticut wrapper seldom wraps its own leaves, but is used on a Cuban, Pennsylvania, Ohio, or Wisconsin filler. The present prevailing grade in the Connecticut Valley is a wrapper leaf, the second quality being used as a binder. In Pennsylvania at the present time the quality is a filler leaf, except on the river lands, where a light, thin-textured leaf is produced, which makes wrappers of a superior quality. The New York lands produce a good type of wrapper, and the crop at present is mainly a wrapper and binder grade. The Ohio tobacco is essentially a filler, and is covered with a Cuban, Sumatra, Connecticut Valley, or Wisconsin wrapper. The tobacco lands of Wisconsin appear to be nearly an average of the other States,

and to produce in nearly equal excellence a wrapper and a filler leaf. It is commonly called a binder State.

#### THE CONNECTICUT VALLEY SOILS.

The tobacco soils of the Connecticut Valley are confined at present to the light, alluvial, sandy terraces and plains bordering the Connecticut River from northern Massachusetts down to within a few miles of the Sound. These soils are the general type of the early truck soils of the Atlantic coast. As a rule the lighter the texture—that is, the less clay they contain—the thinner the texture of the tobacco leaf and the more elastic, pliable, and better the wrapper it will make. The yield per acre, however, on these very light soils is very small, and the care necessary to keep the plant growing and to protect it from the occasional drought is expensive; so that there is a limit of profitable production. On these light soils the plant must be kept growing at all hazards; for if the growth is retarded by too great a deficiency of water at any time, the plant will be small and the leaves thick and harsh. With continuous and rapid growth, such as is secured on these soils in favorable seasons, the leaf is of very thin texture, silky, pliable, light-colored, and admirably adapted for a cigar wrapper. Unquestionably some form of irrigation could be profitably adopted on these soils. It is the experience in Florida that if the plant can be kept growing by frequent rains or by judicious irrigation, the maturity of the crop can be greatly hastened; so that the growing season is only about half as long as it would be under unfavorable weather conditions. Every possible means should be taken to secure a continuous growth, and any check, however slight it may seem, must be regarded as a positive injury to the quality of the product if it is to be used as a wrapper leaf. The wrapper should have little body and but little flavor.

The binder is a low-grade wrapper which, from its quality or appearance or both, is not suitable for the outside covering of the cigar.

The filler leaf, being worth much less per pound than the wrapper, is too often neglected in this country, and when cured is but little better than dried leaves or has a very rank, strong flavor. This is a very great mistake, as the filler, forming the main bulk of the cigar, should give it character and flavor. Too much care and attention could not be given to the growing and fermenting of the filler leaf, were it not for the fact that the market demands a good-looking cigar above all else. The quality is a very much smaller factor in determining the market value. The filler should always be a leaf of good body and much stronger and richer in its flavor than the present type of wrapper. The rich, heavy clay soils of Pennsylvania and Ohio are admirably adapted to produce a rich, heavy filler leaf. Unfortunately, the methods of curing and fermentation are not so controlled as to develop the best quality of the leaf, as is done in Cuba.

The tobacco soils of the Connecticut Valley, both in Massachusetts and in Connecticut, contain on the average considerably less than 5 per cent of clay. These soils are too light in texture for any of the staple farm crops. They are adapted to the quick-growing spring vegetables, but are not used to any great extent for these crops, except immediately around the cities and larger towns. The conditions seem to be peculiarly adapted to this particular grade of wrapper leaf tobacco.

It must not be forgotten, however, that fashion has much to do in the consumption of cigars. Just at present the demand is for light wrappers and mild-smoking cigars. A few years ago the demand was for heavier cigars, and these light soils of Connecticut had little or no value then for tobacco and were lying out as waste land. At that time the tobacco was grown mainly on the heavier soils and on the "meadow lands" of the Connecticut Valley. These meadow lands are very retentive of moisture and contain upward of 23 to 27 per cent of moisture, while the finest types of tobacco land in the Connecticut Valley contain only about 7 per cent. These meadow soils are therefore not used for tobacco at present, but if in the course of events the style should change and dark wrappers come into vogue, these lands will again be taken up and the present tobacco lands will have to be abandoned or used for other crops.

#### PENNSYLVANIA CIGAR TOBACCO LANDS.

The tobacco soils of Pennsylvania are confined mainly to a comparatively narrow belt bordering the Susquehanna River and to the broad expanse of limestone soils typically developed in York and Lancaster counties.

The better class of tobacco lands in Pennsylvania, and those which produce by far the finest wrapper leaf, are the light, alluvial soils along the river, similar in texture to the tobacco soils of the Connecticut Valley. The main crop, however, of the Pennsylvania tobacco has been grown on the limestone soils of York and Lancaster counties. These are a continuation of the great limestone valley extending down through Maryland and Virginia and to the great area of the Trenton limestone formation in Ohio and Kentucky, forming the great blue grass region of these States upon which the White Burley tobacco is at present grown.

This limestone soil, as it is exposed in the tobacco districts of Pennsylvania, is a strong clay soil, well adapted to grass, wheat, and corn. It forms one of the most productive areas in the State of Pennsylvania, and in this respect it is markedly different from the tobacco lands of the Connecticut Valley. There is considerable variety in the texture of the soils, as the limestone itself is not pure, but is mixed with shale. The amount of clay, therefore, in these Pennsylvania lands varies from about 13 per cent in the river soils and in the very shaly limestone

soils to about 30 per cent on the average in the pure limestone soils. The former grade of soils is preferred just at present to the very heavy ones, as they produce a better grade of wrapper leaf. By proper cultivation, close planting, and especially by proper fermentation and grading of the leaf, the quality of the filler grown on the heavy limestone soils could unquestionably be greatly improved.

These soils maintain about 20 to 22 per cent of water.

#### OHIO CIGAR TOBACCO LANDS.

The cigar tobacco district of Ohio is situated in the southwestern part of the State and includes the country bordering the Miami River, Montgomery, Darke, and Preble counties forming the center of the district. The Miami Valley, in the tobacco area, is from 2 to 5 miles wide, level, and extremely fertile. Bordering the valley are upland rolling hills. Broad terraces extend back from the river in a number of places, giving second bottoms, beyond which come the great rolling red lands upon which tobacco is raised with great success. These soils are well drained, with numerous streams flowing out from between hills. Farther back on the level prairies the land is inclined to be wet and needs thorough underdraining to be profitably cropped. Throughout the whole tobacco area, underdrainage is practiced to a large extent.

The soil is derived from drift material which has been worked over and modified by subsequent action of water. The underlying rock is the Lower Silurian limestone shale, but it forms no feature of the surface, as it is covered by the drift material. There is quite a variety in the character of the soil, owing to the heterogenous nature of the material from which it has been derived. The bottom soils are, as a rule, much lighter in character than the upland soils. The second and third bottoms, in cases where they occur, are level terraces. The soils vary much, the black prairie soil and the red silty soil predominating. The soils of the rolling uplands are more uniform in character. The timber is mainly sugar tree, and on this sugar-tree land the finest grade of tobacco is produced. The sugar-tree soil is a thin, uniform, silty soil, with red clay or silty subsoil. The lower levels of this upland contain considerable areas of black land, which is considered the best land in the district for general agricultural purposes, but which produce too heavy a leaf and one of poor flavor, so that it is not desirable for tobacco culture. Wheat, corn, hay, and tobacco constitute the staple crops of the district, although on the sandy river lands truck and fruit growing are carried on to a large extent.

Three types of cigar leaf are raised in this district. The most popular at present is the Zimmer Spanish. This has small leaves about 12 inches long, of very fine texture and flavor. It produces about 1,000 pounds per acre. The old Ohio seed leaf is a very large, heavy leaf, 20 inches or more in length, and produces from 1,500 to 2,000 pounds

per acre. This is little grown in the district at the present time. The Little Dutch has a thick, short, narrow leaf which produces about 1,200 pounds per acre and was at one time very extensively grown. These tobaccos are grown almost exclusively for filler purposes, and the soils have a large percentage of silt.

#### WISCONSIN TOBACCO SOILS.

The Wisconsin tobacco is used both as a wrapper and filler leaf to some extent, but the State is known in the markets as a binder State. The character of the leaf is midway between the Connecticut wrapper and the Pennsylvania filler.

The tobacco is grown in the southern part of the State on the prairies and oak openings. The prairies are a dark, rich loam, resting on a rather heavy silt or clay. The oak openings have a loam lighter in color but about the same in texture. Both are gently rolling and, as a rule, have good surface and under drainage. In texture the Wisconsin lands come between the Connecticut and the heavier limestone soils of Pennsylvania.

#### SOUTHERN CIGAR TOBACCO DISTRICTS.

Tobacco has been grown for many years in Florida, especially in the western part of the State. The tobacco grown there is mainly the Cuban type of cigar wrapper and filler, with some Sumatra lately introduced. The recent scarcity of Havana tobacco has given a great impetus to the cultivation of the crop in Florida, and very extensive arrangements have been made to introduce it to a large extent in the central part of the peninsula.

#### WESTERN FLORIDA.

The soils of the older Gadsden County district in the western part of the State are very different from any others which occur in Florida. They are the characteristic "red-land" soil of the Lafayette formation, similar to those found at Wedgefield and Aiken, S. C., which extend south through Georgia and form some of the western counties of Florida, with Quincy as a center. The soil is a light loam resting on a very strong red clay. The clay is exposed in all cuts and in the washings of the land, and is usually found from 8 to 18 inches below the surface. The country is quite rolling, well wooded with hard wood trees, and in the early spring it has the fresh green appearance of the country in the Valley of Virginia and in the tobacco area of Pennsylvania.

Both the Cuban and Sumatra types of tobacco are grown here, and both are used for wrappers as well as fillers. Unlike the imported Sumatra tobacco, the tobacco grown in Florida from Sumatra seed loses much of its bitter taste, while the sucker crop and inferior leaves are cured up with more body and are much better adapted to filler purposes.

The season is so long that two crops of tobacco can be produced in the same year, or two or three sucker crops can be grown after the main cutting has been taken. The sucker crop is stronger, heavier, and darker, and is used only as a filler.

The top soil is a light loam resting on a red-clay subsoil, and the character of the land as a tobacco soil depends largely upon the character of the red-clay subsoil and its depth below the surface. These lands maintain on an average only about 8 or 10 per cent of moisture, against 20 to 22 per cent maintained by the Pennsylvania and the Ohio lands.

#### THE FLORIDA PENINSULA.

Outside of this area in western Florida most important developments have recently been made around Ocala, Bartow, and Fort Meade. At Fort Meade, particularly, there is a well-organized company of Cubans with a large area in tobacco. The first crop was made in 1896. The tobacco was cured and fermented according to the Cuban processes, and without waiting to mellow with age, as is necessary to bring out the finest qualities of a tobacco, the crop was sold at Tampa for a very satisfactory price.

Tobacco growing on the peninsula is essentially a new industry, and comparatively little experience has been available except what has been collected during the season of 1897. The industry has been developed principally upon the post-oak lands around Ocala, and upon the hammock lands at Bartow and Fort Meade. There are large areas of these soils in the State which can be developed through the tobacco interest, and there is every reason to believe that the venture will be very successful. There is no reason to doubt that many of the pine lands are well suited to tobacco.

There is very little difference in the texture of the post-oak lands, the hammock lands at Fort Meade, and the pine lands. The difference in the soil which causes the distribution in the forest growth appears to be mainly due to the difference in the water content of the soils. The soils are all very light and sandy. They contain on an average less than 4 per cent of clay and less than 6 per cent of silt, fine silt, and clay. They contain over 50 per cent of "fine sand," so that they are relatively rather coarse and open. Notwithstanding this open texture the hammock soil at Fort Meade contains on an average about 8 per cent of water throughout the season, which is about as much as the tobacco lands of the Connecticut Valley contain. This water content, moreover, is for some reason more uniform, and the land can go for some time without rain with no serious injury to the crops. Nevertheless the planters have been greatly benefited by judicious systems of irrigation through overhead sprays. By thus keeping the plants continually and rapidly growing the crop will mature in forty-five days from the time the plants are set out. On account of the length of the season tobacco can be grown almost continually through the year, and

crops can be set out almost every month in the year. Usually two or three crops are made and two or three sucker crops are produced. There is undoubtedly a vast area of land in Florida suited to tobacco, and the climate is unquestionably favorable for the production of a very fine quality of leaf. A very intelligent method of growing and fermenting is being practiced, and there is no reason why the industry should not be successful.

#### **BRIGHT-TOBACCO LANDS.**

The bright yellow tobacco used for cigarettes, plug wrappers, fillers, and cutting is grown mainly in Virginia, North Carolina, South Carolina, and East Tennessee. It is, however, produced in smaller quantities in several of the other Southern States. Wherever it is grown the industry is confined to a certain type of soil.

The typical bright-tobacco land consists of a loose, porous sand, containing not more than 8 or 10 per cent of clay. This sand must be at least 12 inches deep. Many areas are cultivated in which the sand extends to a depth of 5 or 10 feet or more, and a very fine quality of tobacco is produced. As a general rule the less clay the soil contains and the deeper the sand, the finer the quality of the tobacco, providing it keeps growing continuously. The trouble with such very light soils is that they produce but a small yield per acre and there is danger of drought, which would check the growth of the plant and cause the leaves to thicken. It is for this reason, therefore, that it is preferred to have the sand underlaid at a depth of 18 to 22 inches with a heavier clay, which tends to conserve the moisture supply of the soil and renders the plant less subject to the injurious effects of what would otherwise prove a severe drought.

The clay which underlies the bright tobacco lands of Virginia and North Carolina is the same as that upon which the heavy manufacturing and export tobacco is grown. Where this clay is exposed to the surface the heavy type of tobacco is produced; where it is covered from 12 to 20 inches with fine-grained sand the bright tobacco is produced the most profitably.

The country throughout these regions is generally quite rolling, with numerous "draws," or natural ditches, and streams, so that the land is well drained. The sandy covering is usually found on the ridges or slightly elevated plateaus, while the heavy clay may be exposed within a few feet, and the two types of tobacco successfully grown in the same field. For this reason it has never been easy to define the areas of the two types of tobacco; for both are grown in the same counties and frequently on the same farm.

The bright tobacco lands which have been examined contain, on the average, about 8 per cent of clay. This is quite uniform, the extreme range for profitable tobacco culture being probably between 6 and 12 per cent.

As the relation of the physical properties of the soil is not thoroughly understood or practically recognized by the growers, a large amount of land is now cultivated in bright tobacco which is not suited to this plant and which does not produce a good grade. On the other hand, there are large areas not at present under cultivation which could be developed into very fine tobacco lands. The typical bright tobacco soil is of little value for any of the staple farm crops, although, when suitably located near transportation lines, it is admirably adapted to the production of early vegetables, watermelons, and sweet potatoes.

#### **MANUFACTURING-TOBACCO LANDS ON THE ATLANTIC.**

Before the development of the White Burley industry the strong red-clay soils around Charlottesville, Lynchburg, and Danville, Va., and in Granville and neighboring counties of North Carolina, were extensively used for the production of the typical Virginia manufacturing and export tobacco. These areas are located mainly on the gabbro, gneiss, and Lafayette clays. The material is quite uniform, the red subsoils containing from 30 to 50 per cent of clay. The soils are very productive and are well suited to the staple farm crops, such as grass, wheat, and corn. Since the introduction of the White Burley tobacco, however, there has been a very noticeable decrease in the acreage in Virginia, especially of the soil adapted to the heavier types of tobacco, and the cultivation of tobacco on these lands has been almost abandoned. The industry is confined now principally to small areas along rivers, streams, or creeks, and upon recent deposits which can not well be referred to any of the older geological formations and which can not well be examined without a detailed examination of the larger part of the State.

The same remark holds true in regard to the tobacco industry in North Carolina. A great change has taken place very recently, and the acreage devoted to the heavier type of tobacco has been considerably reduced. These heavy clay lands are being used for other crops, and the tobacco is grown upon limited areas in certain districts where the quality of the tobacco produced is such as to make it reasonably profitable. Here, again, it is impossible to make any statement in regard to the tobacco district without making a detailed study of the soils of the State. There seems to be no general type of soil. The tobacco grown upon the soil which was formerly cultivated most extensively is no longer profitable.

#### **WHITE BURLEY LANDS OF KENTUCKY AND OHIO.**

The White Burley tobacco is confined to the well-marked type of soil of the Lower Silurian limestone in central and north central Kentucky and the adjacent counties of Ohio. This embraces the blue-grass region of Kentucky, and it is upon these fine, fertile, blue-grass soils that the White Burley is grown.

The country has the general appearance of an old limestone region,

generally rolling and with frequent depressions, sinks, and caves. The hills, 400 to 500 feet high, bordering the Ohio River and extending from 6 to 10 miles back, are generally steep, and fields are often cultivated in tobacco with slopes as great as 45 degrees. The valleys are narrow, winding, and V-shaped, and no bottom lands are found excepting along the larger rivers and streams. The country back from the hills on the Ohio side is generally rolling. The drainage is excellent.

The tobacco lands on the Ohio side are all within the hills on the Ohio River and confined to two kinds of soil, popularly known as the "sugar-tree land" and "beech land." The beech lands lie low in the valley and are inclined to be wet, and do not produce the finest quality of leaf. The sugar-tree lands lie well up in the valleys and are considered the typical White Burley soil. Back from the hills in Ohio the soil becomes white, wet, and "crawfishy" and does not produce a fine quality of Burley. These flat lands are of drift origin, timbered with white oak, and usually need to be underdrained in order to produce well.

In Kentucky the tobacco area is confined to the Trenton and Hudson River limestones. Phosphatic limestone is frequently met with, while chert occurs only sparingly through the area.

The soils are all heavy clay of a uniform deep red color. The depth of the soil varies considerably, the rocks outcropping in many places, especially on the hillsides. Around Lexington the rock is on the average about 6 feet below the surface, while in the northern counties it is at a greater depth than this. The top soil is of light, loamy character, not inclined to form into clods when properly cultivated. The soil is adapted to grass, wheat, and corn, and has made famous, the world over, the blue-grass region of Kentucky. The subsoil contains on an average about 30 per cent of clay and maintains about 20 to 22 per cent of water.

#### **EXPORT-TOBACCO LANDS OF KENTUCKY AND TENNESSEE.**

The dark, heavy varieties of tobacco adapted to the export trade are extensively grown in western Kentucky and Tennessee on silty soils which are quite fertile in character. The whole area is divided into a number of districts, such as Clarksville, Hopkinsville, Jackson's Purchase, and the Green River district, but the character of the soil is quite uniform in all of these; the class of tobacco grown is generally the same. In each district the types of tobacco adapted to the foreign markets are grown, the types appearing to depend less upon the character of the soil than upon the character of the season, the cultivation, and curing of the crop.

The general character of the country is level or gently rolling, with broken and hilly country along the large water courses. Much of this land was formerly devoid of forest growth and called barrens. It was a prairie region, with trees only along the water courses, and prairie fires are supposed to have annually swept over the country. Since the

country has become settled and the large fires prevented a luxuriant forest growth of hickory and oak has covered the land.

The counties of Kentucky bordering the Tennessee line are generally level, with occasional stretches of rugged country along the water courses, but with a soil of quite uniform texture. The southern boundary of the tobacco area is the Cumberland River, while the northern boundary is the Carboniferous hills of Kentucky. The tobacco district stretches around these hills, following the Subcarboniferous strata as far as the Ohio River on either side.

The soils are mainly derived from the St. Louis group of the Subcarboniferous, which are mainly limestone. The disintegrated material is so thick, that the rock is seldom exposed except where the material has been recently eroded. The drainage is excellent, and numerous sinks and caves are found through the country. The soil, whether upland or bottom, level or hilly, is usually of a decided silty character, closely approaching loess in texture. The subsoil has a typical bright red color, which extends to a considerable depth. Where this red color changes to a pale yellow or white the land becomes "crawfishy," and can be profitably cultivated only after under-drainage. The lack of color indicates a deficient drainage within recent times, and is due to the deoxidation of the iron compound in the decay of organic matters and the absence of sufficient oxygen from other sources to provide for the proper oxidation of the organic matter.

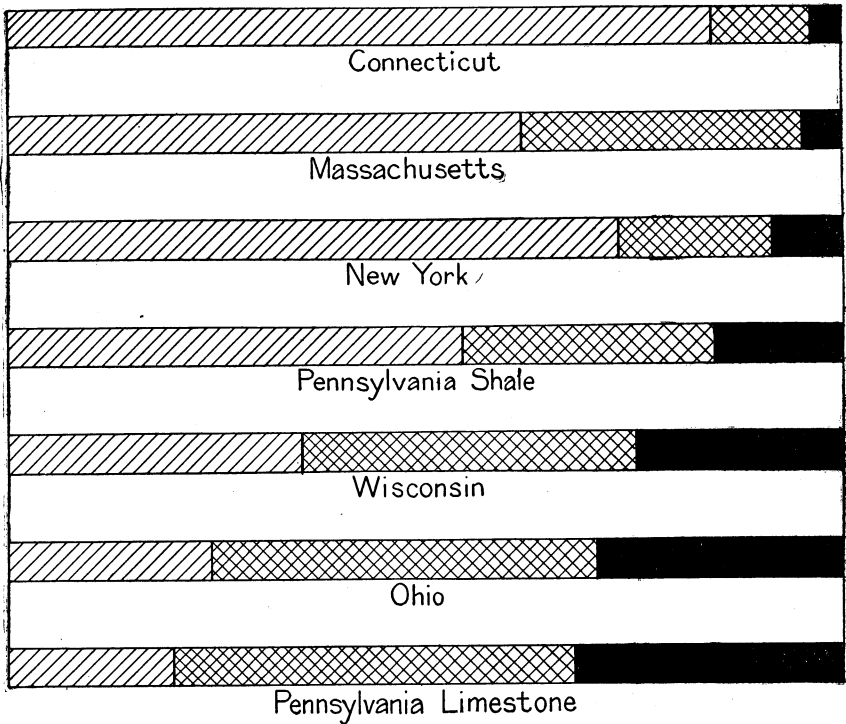
These soils contain on an average about 50 per cent of silt. The range is from about 40 to 60 per cent, some samples exceeding even this latter figure. With all such silty soils great care has to be taken in their cultivation. They are naturally quite fertile, but deteriorate very rapidly and excessively unless the fertility is maintained by judicious methods of cultivation and of cropping. Many of these tobacco soils have been run down with constant cropping in tobacco, but some of the worst cases have recently been brought up by rotation with wheat, corn, and clover, together with a judicious application of fertilizers, especially phosphatic manures. The value of careful tillage is becoming more apparent in the whole area, and it is generally recognized now that the quality of the tobacco and the price it brings on the market can be very materially influenced by the kind and condition of the cultivation.

The soils of the Lower Green River district lie within the Carboniferous strata along the Green River, and, although these are underlaid with sandstone, the soil proper presents the uniform silty character of the other export-tobacco districts.

The Jackson's Purchase region, lying between the Tennessee and Mississippi rivers, is made up mainly of loess and loam, and has the same silty character as the other districts and produces essentially the same type of tobacco.

The accompanying diagram illustrates graphically the relative proportion of the sand, silt, and clay in the soil adapted to different classes and types of tobacco, and shows, upon careful study, a marked relation between the texture of the soil and the grade of tobacco produced.

## CIGAR TOBACCO



## MANUFACTURING AND EXPORT TOBACCO

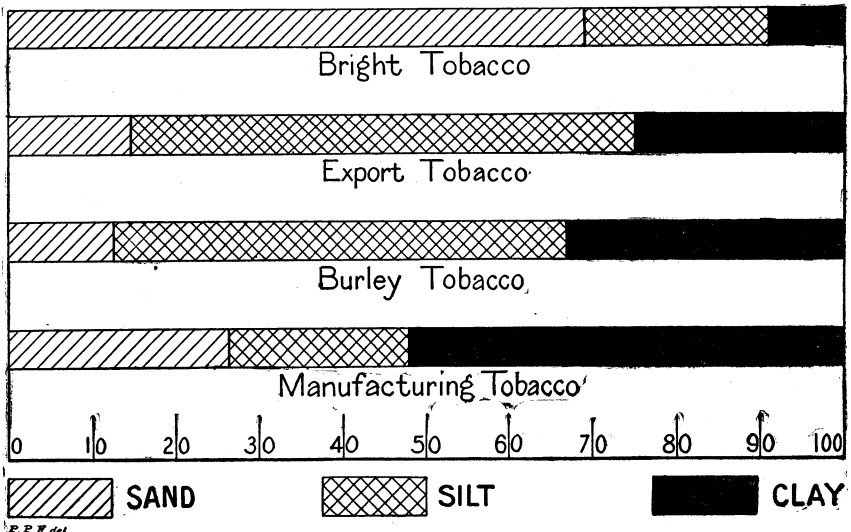


FIG. 1.—Relative proportions of principal constituents of tobacco soils.

## THE WATER CONTENT OF TOBACCO SOILS.

The amount of water a soil contains depends largely upon the texture and structure, and is influenced, of course, by the character of the season. It varies from day to day, and these variations are exceedingly important in their effects upon the crop.

### WATER IN THE NORTHERN CIGAR-TOBACCO SOILS.

Tobacco soils of the best grade in the Connecticut Valley maintain on an average about 7 per cent of water throughout the season. There are many soils cultivated in tobacco which average 10 or 12 per cent, but these do not produce a tobacco leaf of the finest texture and most desirable quality for the present market. On the other hand, there are soils cultivated in tobacco which maintain less water than this, and while in favorable seasons, when the tobacco is kept constantly growing, they produce a very fine and delicate leaf, it is not on the whole a safe or economical condition under which to grow the plant, on account of the small yield per acre and the injury liable to occur in dry seasons. The meadow lands of the Connecticut Valley, which were formerly cultivated in tobacco when a dark heavy leaf was in demand, contain on an average from 20 to 28 per cent of water. As already stated, these soils are entirely unfit for the production of the grade of tobacco necessary to meet the present market demands.

The tobacco soils of Pennsylvania, as already explained, are heavier than those of the Connecticut Valley and maintain on an average about 18 to 22 per cent of water.

Soils which produce the best wrapper leaf in Pennsylvania are those which have the lightest texture and contain the smallest water content, while the heaviest limestone soils maintain on an average 22 to 23 per cent of water and produce mainly a heavy strong filler leaf.

The soils of the tobacco district of Ohio are as heavy in texture as the limestone tobacco lands of Pennsylvania. They maintained on an average during the season of 1897 rather more than 27 per cent of water, but this was a wet season. It is probable that the mean water content of these soils in an average season would amount to about 23 to 24 per cent of water. The tobacco grown under these conditions is used almost exclusively as a filler leaf.

It is unquestionably true that the texture of the soil and the meteorological conditions, with the resultant water content, determine to a marked extent the character and grade of leaf which can be produced. In this, as in all other agricultural lines, the aim should be to recognize the conditions and adopt the crop, the method of cultivation or fermentation, and the grade of leaf which those conditions are best adapted to produce. If the general character of the soil in a locality is adapted to the wrapper leaf, use only such soils as may be reasonably expected to give the best wrapper leaf. If, on the contrary, the soils of the dis-

trict are adapted only to filler leaf, use only such of the soils as are best adapted to this grade, and plant, cultivate, manure, and ferment the crop for the specific purpose of producing a filler leaf of superior quality. Most of the tobacco soils of the Northern States will not produce equally good fillers and wrappers.

#### **WATER IN THE FLORIDA TOBACCO SOILS.**

Records have been kept during several seasons of the moisture conditions in the soils of the Gadsden County district of west Florida and of the newer tobacco district of Fort Meade, in the peninsula. The mechanical analyses showed that the tobacco land in western Florida consisted of a light loam, about 12 inches deep, resting on a heavy red clay, which is naturally well drained. The hammock soil of Fort Meade is, on the other hand, a very light sandy soil, extending down to a very considerable depth. Both soils produce a hard wood growth. Strange to say, in spite of the great difference in the texture of the subsoil, the soils of these two localities maintain about the same amount of moisture. The average water content of the soil at Fort Meade, for a period of four months, in 1897, was 8.6 per cent, while the mean water content of the soil at Quincy for the same time was 8.26 per cent. It is a surprising thing to find that these soils maintain about the same amount of water, but this is in line with the general facts that the hammock soils of Florida maintain very much more water than would be expected from their texture, or than is maintained by soils of similar texture farther north along the Atlantic coast.

No records have been kept of the moisture conditions in the tobacco soils of Texas or of California, and unfortunately none have been kept in the tobacco soils of Sumatra and Cuba.

#### **WATER IN THE SOILS OF THE MANUFACTURING AND EXPORT TOBACCO DISTRICTS.**

As in the northern cigar-tobacco district, it will be seen that the texture of the soil and the water content appear to determine the type of tobacco produced. The typical soils for the bright yellow tobacco of Virginia, North Carolina, and East Tennessee maintain on an average about 7 per cent of water. Where the soils contain less than this the leaf is inclined to be thinner in texture and to have a better color, but the yield per acre is small, and the most economical conditions on the whole are maintained by these soils having from 7 to 8 per cent of clay and maintaining on an average about 7 or 8 per cent of water. As the soil becomes heavier in texture and the amount of water increases, other grades and types of tobacco are produced.

The export tobacco lands of Kentucky and Tennessee contain about 22 or 23 per cent of clay and from 40 to 60 per cent of silt. These soils contain on an average about 15 per cent of water.

The characteristic soil of the limestone area of Kentucky, adapted to the White Burley tobacco, as the result of several years' investigation, may be said to maintain on an average about 20 per cent of water.

Records have not been kept of the water content of the manufacturing tobacco soils of Virginia, but from investigations which have been made on adjacent lands it is probable that the mean water content of these soils, having as much as 40 per cent of clay, will not be far from 20 or 22 per cent of moisture.

#### **CONTROL OF THE WATER SUPPLY OF THE SOIL.**

It is evident from the work that has been done in the Division of Soils that the peculiar adaptation of certain soils to certain types of tobacco is largely dependent upon the relation of the soils to water and the amount of water they maintain. The great difference in the water content of soils adapted to the different types of tobacco has been pointed out. Tobacco of a given quality can only be grown economically where the conditions are adapted to it, but these conditions are liable to vary in any soil throughout the season. It therefore becomes necessary in order to secure the best results to maintain some control over the water supply of the soil, in order to keep the conditions as nearly perfect as possible throughout the season. Much can be done to control the water supply through methods of preparing the land and of cultivating the crop, as has been pointed out in several bulletins of the Division of Soils and in numerous publications from other sources.

The farmer should select the type of tobacco best suited to his locality and to the peculiar soil conditions with which he has to work, and should adopt such methods of cultivation as will maintain as nearly as possible the best conditions for the quality of leaf it is proposed to raise.

## FARMERS' BULLETINS.

These bulletins are sent free of charge to any address upon application to the Secretary of Agriculture, Washington, D. C. Only the following are available for distribution:

- No. 15. Some Destructive Potato Diseases: What They Are and How to Prevent Them. Pp. 8.
- No. 16. Leguminous Plants for Green Manuring and for Feeding. Pp. 24.
- No. 18. Forage Plants for the South. Pp. 30.
- No. 19. Important Insecticides: Directions for Their Preparation and Use. Pp. 20.
- No. 21. Barnyard Manure. Pp. 32.
- No. 22. Feeding Farm Animals. Pp. 32.
- No. 23. Foods: Nutritive Value and Cost. Pp. 32.
- No. 24. Hog Cholera and Swine Plague. Pp. 16.
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- No. 32. Silos and Silage. Pp. 31.
- No. 33. Peach Growing for Market. Pp. 24.
- No. 34. Meats: Composition and Cooking. Pp. 29.
- No. 35. Potato Culture. Pp. 23.
- No. 36. Cotton Seed and Its Products. Pp. 16.
- No. 37. Kafir Corn: Characteristics, Culture, and Uses. Pp. 12.
- No. 38. Spraying for Fruit Diseases. Pp. 12.
- No. 39. Onion Culture. Pp. 31.
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- No. 57. Butter Making on the Farm. Pp. 15.
- No. 58. The Soy Bean as a Forage Crop. Pp. 24.
- No. 59. Bee Keeping. Pp. 32.
- No. 60. Methods of Curing Tobacco. Pp. 16.
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- No. 62. Marketing Farm Produce. Pp. 28.
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- No. 79. Experiment Station Work—VI. Pp. 28.
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